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## Some noteworthy Hepaticae from the state of Washington

LOIS CLARK

(WITH PLATE 20)

Although Washington is the smallest of the three Pacific Coast states, it has an area of over sixty-nine thousand square miles and presents a great variety of climatic and physiographic conditions. The Cascade Mountains divide the state into eastern and western Washington. In eastern Washington the climate is hot and dry in the eastern and southern portions, cool and moist in the western and northern, especially along the eastern slopes of the mountains. In western Washington the climate is cool and moist throughout, and the whole region abounds in shaded water courses and extensive forests. The state, therefore, throughout the greater part of its extent, is exceedingly favorable for the growth of a rich hepatic vegetation.

Taking the state as a whole, there is only one small area, the university campus at Seattle, where the Hepaticae have been at all thoroughly collected. Other regions which have received some attention are Paradise Valley on Mount Ranier, Queets River valley and Elwha River valley in the Olympic Mountains, and Stevens Pass in the Cascade Mountains. Elsewhere in western Washington very little has been done, and in eastern Washington the Hepaticae have been still more neglected. In spite of the work to be accomplished before our knowledge of the hepatic flora approaches completion, the writer, from collections already made, has been able to identify 101 species from the state, a number which compares favorably with the 86 species known from California and the 117 species known from British Columbia. The most important of the collections studied were made by Professor O. D. Allen, Mr. A. S. Foster, and Professor T. C. Frye.

Scarcely anything has been published on the Hepaticae of Washington. Underwood's list of 1891 \* enumerates 16 species,

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\* A preliminary list of Pacific Coast Hepaticae. *Zoe* 1: 361-367. 1891.

and Roell's list of 1893,\* 23 species, no fewer than 19 being additions to Underwood's list. Howe has since reported three more species, Stephani two, and C. Müller, of Freiburg, two, so that 42 species in all have been definitely reported from the state. As noted above, this number has been considerably more than doubled by recent investigations.

The present paper makes no attempt to give a complete account of the species known from the state. It simply calls attention to nine species which are of more than passing interest. These include one species new to science and a new variety of a recently published *Scapania*. Of the remaining species noted four are new to North America and three to the United States, although previously reported from the Canadian provinces.

ASTERELLA LINDENBERGIANA (Corda) Lindb.

*Fimbriaria Lindenberghiana* Corda; Nees von Esenbeck, Naturg. Europ. Leberm. 4: 283. 1838.

*Fimbriaria Bonjeanii* DeNot. Mem. Accad. Torino II. 1: 335. *f. e.* 1839.

*Asterella Bonjeanii* Trevis. Rend. Ist. Lomb. Sc. II. 7: 777. 1874.

*Hypenanthron Bonjeanii* Trevis. Mem. Ist. Lomb. III. 4: 440. 1877.

*Asterella Lindenberghiana* Lindb. Musc. Scand. 1. 1879.

*Hypenanthron Lindenberghianum* O. Kuntze, Rev. Gen. 1: 89. 1891.

On wet soil. Queets River valley and Elwha River valley, Olympic Mountains, at an altitude of 4500 feet, *Frye* (63, 71). New to North America, but widely distributed in Europe although nowhere abundant.

*A. Lindenberghiana* is one of the larger species of the genus. As Howe† clearly shows, it agrees in this respect and also in general habit with *A. californica* (Hampe) Underw., which is still known from California only. The two species agree also in developing their inflorescences either on the main thallus or on

\* Nordamerikanische Laubmoose, Torfmoose, und Lebermoose. Hedwigia 32: 181-203; 260-309; 334-402. *pl. 9-10.* 1893.

† Mem. Torrey Club 7: 50. 1899.

its principal divisions, instead of on short ventral branches. *A. Lindenbergiana* may be at once distinguished by its monoicous inflorescence, by its violet-red pseudoperianth, by its dark purple spores, and by its red elaters. In *A. californica* the inflorescence is dioicous, the pseudoperianth is white, and the spores and elaters are yellow. The remaining species of the Pacific Coast, although all monoicous, are considerably smaller than *A. Lindenbergiana*, and in two of them, *A. violacea* (Aust.) Underw. and *A. Bolanderi* (Aust.) Underw., the inflorescences both male and female are borne on short ventral branches. In *A. violacea* the pseudoperianth is usually violet, but the spores and elaters are yellow, becoming brownish with age; in *A. Bolanderi* the pseudoperianth is white and the spores and elaters are yellowish brown. Three other species, *A. fragrans* (Schleich.) Trevis., *A. gracilis* (Web. f.) Underw., and *A. Palmeri* (Aust.) Underw., remain to be considered, all of which agree with *A. Lindenbergiana* in the position of the inflorescences but differ in their white pseudoperianths. *A. fragrans* is further distinguished by the numerous white appendages of the ventral scales, which project far beyond the margin in the apical region; *A. pilosa*, by the yellow spores and elaters; and *A. Palmeri*, by the opaque and dark brown spores and yellow elaters.

PALLAVICINIA BLYTTII (Moerck) Lindb.\*

*Jungermannia Blyttii* Moerck; Hornemann, Fl. Dan. 12: 6. *pl.* 2004. 1830.

*Blyttia Mörkii* Nees; G. L. & N. Syn. Hep. 474. 1846.

*Moerckia Blyttii* Brockmann, Arch. Ver. Freunde Naturg. Mecklenburgs 17: 190. 1863.

*Pallavicinia Blyttii* Lindb. Not. Sallsk. F. et Fl. Fenn 9: 17. 1868.

*Calycularia Blyttii* Steph. Mem. Herb. Boissier 16: 6. 1900.

On wet rocks. Near Hume's Glacier, Queets River valley, Olympic Mountains, at an altitude of 5000 feet, *Frye* (56). Paradise Valley, Mount Ranier, 5000 feet, *Flett*. New to North America, but widely distributed in Europe in subalpine localities.

The present species bears a strong resemblance to *P. Flotowiana* (Nees) Lindb., which is now known from several widely scat-

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\* Only a few of the synonyms are here given.

tered stations in North America. It agrees with it also in the structure of the thallus, the thickened median portion of which is usually composed throughout of parenchymatous tissue. In this respect both species differ markedly from *P. Lyellii* (Hook.) S. F. Gray and its immediate allies, in which the thallus is characterized by a median strand of narrow elongated cells, forming a very conspicuous feature of the plant. *P. Blyttii* is a little more robust than *P. Flotozwiana* and may be easily distinguished by its golden-yellow rhizoids, by its bluntly lobed archegonial scales, and by the ridges of its spores, which are beset with short and truncate spines. In *P. Flotozwiana* the rhizoids are white, the archegonial scales are sharply cleft, and the ridges on the spores are smooth along their margins.

NARDIA BREIDLERI (Limpr.) Lindb.

*Alicularia Breidleri* Limpr. Jahresb. Schlesisch. Gesells. für vaterl.

Cultur **47**: 311. 1880.

*Nardia Breidleri* Lindb. Medd. Soc. F. et Fl. Fenn. **6**: 252. 1880.

On wet soil. Mount Ranier, at an altitude of 6300 feet, *Allen*. An arctic and alpine species new to North America but widely distributed in Europe and known also from Siberia.

*Nardia Breidleri* grows in flat, depressed mats close to the snow line and is greenish brown in color. It is much smaller than our other species of the genus and looks at first sight more like a *Cephalozia*. It even agrees with *Cephalozia* in the occasional presence of postical branches, although the branching is typically lateral, as in the other species of *Nardia*. The leaves in *N. Breidleri* are either orbicular or a little broader than long and are also more or less concave. They are often bifid one fourth to one third, with obtuse sinus and rounded lobes, but are sometimes only emarginate at the apex. The leaf-cells, mostly 10–16  $\mu$  in diameter, have a smooth cuticle and thin walls destitute of trigones. The underleaves are minute and subulate, although sometimes vaguely bifid. Apparently the closest ally of the species is *N. Geoscyphus* (DeNot.) Lindb., which also may be recorded from Washington. It is considerably larger than *N. Breidleri*, the leaves are much more variable, being sometimes undivided and sometimes variously bifid, and the leaf-cells, which measure 20–30  $\mu$

in diameter, have distinct trigones. It is also paroicous in its inflorescence while *N. Breidleri* is dioicous. In both species the perigynium bears a rudimentary sac at the base, differing in this respect from all our other species of the genus.

***Jungermannia Allenii* sp. nov.**

Brownish green or reddish, growing in tufts: stems 1.5–3 cm. long, 0.15–0.25 mm. in diameter, ascending or suberect, sparingly branched, the branches arising close to the postical end of the line of attachment of the leaves; rhizoids few or wanting, not pigmented: leaves distant to subimbricated, obliquely inserted, somewhat concave, slightly decurrent, oval to subrotund, 1–1.5 mm. long, 0.8–1.35 mm. wide, undivided or slightly emarginate, entire, bordered by a row of more deeply pigmented cells; median leaf-cells from 20–30  $\mu$  in diameter, trigones large and distinct, cuticle striolate: underleaves sometimes minute and fugacious, sometimes large and persistent, mostly 20–40  $\mu$  in length and bearing numerous hyaline papillae, the large ones occasionally attaining a length of 1 mm., sometimes undivided, sometimes variously bilobed or bifid: inflorescence dioicous. [PLATE 20, FIGURES 1–11.]

On rocks, more or less submerged. Paradise Valley, Mount Ranier, *Allen, Flett*. Professor Allen's specimen, which may be considered the type of the species, is deposited in the herbarium of A. W. Evans, at New Haven, Connecticut.

The specimens examined are all sterile with the exception of a single plant bearing a very immature female inflorescence. On the basis of this plant the species is assumed to be dioicous. Unfortunately in the absence of mature floral organs, the generic position cannot be definitely determined. The reddish pigmentation, which is sometimes very marked, points perhaps to *Nardia* or *Jamesoniella*, but it seems wisest to retain the species in *Jungermannia*, at least for the present. In habit and in size it somewhat resembles *J. cordifolia* Hook., which is not uncommon in Washington, although it has not before been recorded from the state. In this species, however, the pigmentation is never reddish, the leaf-cells are wholly destitute of trigones, and there are no underleaves. In *Nardia compressa* (Hook.) S. F. Gray, with which the new species may also be compared, the two rows of plane or slightly concave leaves are laterally appressed to each other, the cuticle is smooth, and the underleaves are uniformly minute and triangular. The

large underleaves in *J. Allenii* are by no means frequent, many stems failing to show them altogether, yet they constitute a striking feature of the species.

JUNGERMANNIA RIPARIA Tayl.

*Jungermannia riparia* Tayl. Ann. & Mag. Nat. Hist. 12: 88. 1843.

*Aplozia riparia* Dumort. Hep. Europ. 63. 1874.

On rocks. Foothills of Mount Ranier, *Allen*. New to the United States but widely distributed in Europe and already reported from British Columbia.

The closest allies of *J. riparia* are *J. cordifolia*, *J. atrovirens* Schleich., and *J. pumila* With. In some respects it is intermediate between the first two and agrees with them in its dioicous inflorescence. It is considerably smaller than *J. cordifolia* and shows a more prostrate habit, producing an abundance of rhizoids and flagella. Its leaf-cells are also distinct in developing trigones, those of *J. cordifolia* having walls of uniform thickness. When compared with *J. atrovirens*, *J. riparia* is seen to be considerably larger and less deeply pigmented, but the two species are apparently connected by intermediate forms. *J. pumila* can be at once distinguished by its paroicous inflorescence.

HYGROBIELLA LAXIFOLIA (Hook.) Spruce

*Jungermannia laxifolia* Hook. Brit. Jung. pl. 59. 1816.

*Gymnocolea laxifolia* Dumort. Recueil d'Obs. Jung. 17. 1835.

*Cephalozia laxifolia* Lindb. Musc. Scand. 3. 1879.

*Hygrobrella laxifolia* Spruce, On *Cephalozia* 73. 1882.

*Cephalozia Notarisiana* Massal. Accad. Sc. Med. Nat. Ferrara 201. 1903.

On wet rocks. Paradise Valley, Mount Ranier, *Frye*. New to the United States, but widely distributed in Europe and already reported in North America from Greenland and Labrador.

Although a small species, *H. laxifolia* exhibits a number of very distinct features. The plants grow in tufts, and the ascending or erect stems develop few or no rhizoids. The branching is lateral, some of the branches being similar to the stem and some flagelliform. The transversely inserted leaves are distinctly complicate and equally bifid for about one third their length with acute

divisions. The underleaves are large and similar to the leaves in the majority of cases, but they are sometimes undivided and sometimes show unequal segments. The leaf-cells are characterized by being more or less elongated, measuring from 40–70  $\mu$  in length and from 20–30  $\mu$  in width; they have thin walls but more or less distinct trigones. The lateral branches, large underleaves, and elongated leaf-cells should at once separate it from the genus *Cephalozia*, to which some authors have referred it, and there is little probability of confusing it with any other northern genus.

DIPLOPHYLLAIA OBTUSIFOLIA (Hook.) Trevis.

*Jungermannia obtusifolia* Hook. Brit. Jung. *pl.* 26. 1816.

*Diplophyllum obtusifolium* Dumort. Recueil d'Obs. Jung. 16. 1835.

*Diplophyllaia obtusifolia* Trevis. Mem. Ist. Lomb. III. 4: 420. 1877.

On wet rocks. Seattle, *Piper*. New to the United States but previously reported from British Columbia. Widely distributed in Europe.

The present species bears a strong resemblance to the dioicous *D. taxifolia* (Wahl.) Trevis., agreeing with it in its rounded leaf-lobes, and it is possible that the two plants have been more or less confused. It is, however, somewhat smaller, and is especially remarkable for its paroicous inflorescence, the antheridia in all other known species being borne on special branches. In the eastern United States, specimens of the recently described *D. apiculata* Evans used to be referred to *D. obtusifolia*, and it is by no means impossible that the true *D. obtusifolia* may yet be detected east of the Mississippi. *D. apiculata* may at once be distinguished by its sharp-pointed leaf-lobes and autoicous inflorescence. In *D. albicans* (L.) Trevis., which is apparently the most abundant species in Washington, the plants are considerably larger, the inflorescence is dioicous, and the leaf-lobes are marked by median bands of elongated cells, simulating nerves in appearance.

SCAPANIA INTERMEDIA (Husnot) Pearson

*Scapania nemorosa*, var. *intermedia* Husnot, Hep. Gall. 22. *pl.* 3. f. 23. 1875.

*Scapania intermedia* Pearson, Hep. British Isles 227. *pl.* 91. 1900.



On damp rocks. Near Hume's Glacier, Queets River valley, Olympic Mountains, at an altitude of 5000 feet, *Frye* (78). New to North America but previously known in Europe from France and England. The determination of the Washington specimens was kindly confirmed by Dr. Karl Müller, of Freiburg in Breisgau, Germany, one of the highest authorities on the genus *Scapania*.

According to Dr. Müller\* *S. intermedia* is a species of somewhat doubtful validity, occupying a position between *S. umbrosa* (Schräd.) Dumort. and *S. dentata* Dumort. and apparently connected with the latter species by transitional forms. It may be distinguished from *S. umbrosa* by the rounded postical lobes of its leaves and from *S. dentata* by its smaller size, smaller leaf-cells, and rougher cuticle. *S. intermedia* is also closely related to *S. Evansii* Bryhn, a North American species which is still imperfectly known. In *S. Evansii*, however, the leaves are less imbricated, and their lobes are less coarsely dentate.

***Scapania paludosa papillosa* C. Müll. Frib. var. nov.**

Reddish brown or almost black: cuticle of the leaves verruculose on both surfaces, the verruculae circular to elliptical in outline, measuring 4–10  $\mu$  in length and about 4  $\mu$  in width in middle of lobe but becoming smaller toward the margin, densely crowded, some of the larger cells showing as many as 25 on each surface: in other respects agreeing with the type. [PLATE 20, FIGURES 12–17.]

On wet rocks. Near Hume's Glacier, Queets River valley, Olympic Mountains, *Frye* (88). A portion of the type is preserved in the herbarium of A. W. Evans, at New Haven, Connecticut.

In the typical forms of *S. paludosa* C. Müll. Frib., the cuticle is smooth or nearly so, and it was at first thought that the roughened cuticle in the Washington specimens would justify separating them as a distinct species. Unfortunately they are completely sterile and, upon submitting them to Dr. Müller for his opinion, it was suggested that the wisest course would be to describe them provisionally as a new variety, reserving final judgment until more complete material should be available. They agree with characteristic *S. paludosa* in showing strongly decurrent leaf-lobes, with blunt apices and a short more or less arched keel. The decurrent

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\* Nova Acta Acad. Caes. Leop.-Carol. 83: 117. 1905.

portions of the lobes are especially distinct in the new variety and form a more or less continuous line along the postical aspect of the stem. They agree in this respect with the variety *vogesiaca* C. Müll. Frib., a golden-green form with exceedingly minute verruculae, known only from the Vosges Mountains in Alsace-Lorraine. The typical form of the species, which is also green, has been collected in several localities in New England, where it seems to prefer the edges of small pools in bogs at rather high altitudes. The Washington specimens mark a wide extension of the known range of the species in North America, and it is also widely distributed in Europe.

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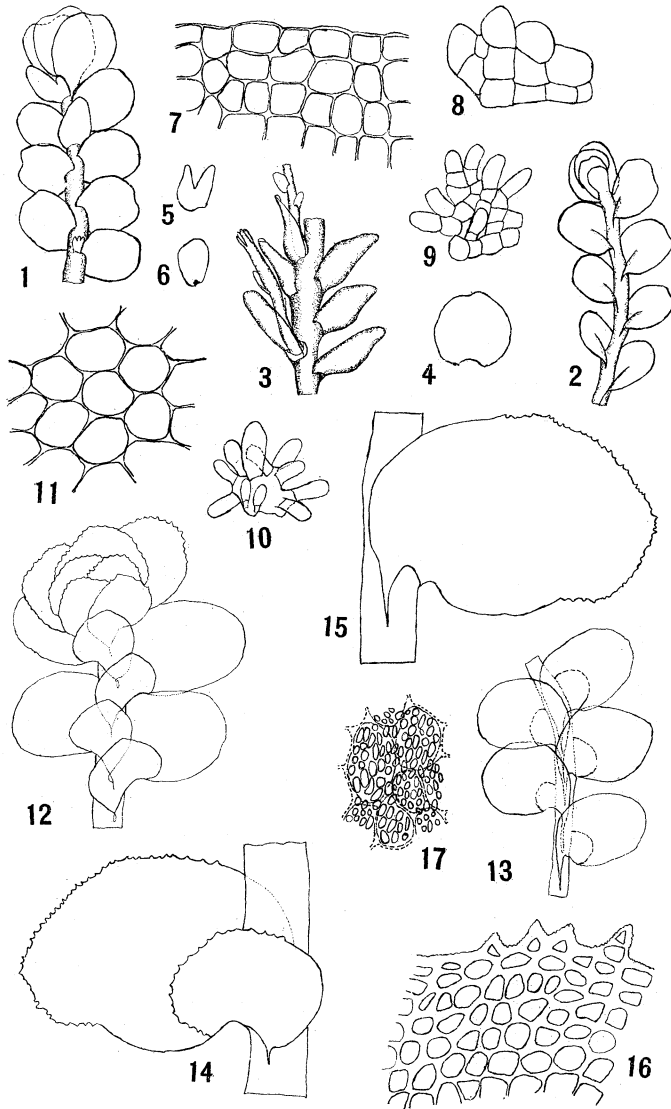
#### Explanation of plate 20

##### 1-11. *Jungermannia Allenii* L. Clark

1. Part of stem, postical view,  $\times 15$ . 2. Part of stem, antical view,  $\times 15$ . 3. Part of stem with two branches, postical view,  $\times 15$ . 4. Leaf,  $\times 15$ . 5, 6. Underleaves,  $\times 140$ . 7. Cells from margin of leaf,  $\times 240$ . 8. Underleaf,  $\times 240$ . 9, 10. Underleaves, showing papillae,  $\times 140$ . 11. Cells from middle of leaf,  $\times 240$ . The figures were drawn from the type specimen.

##### 12-17. *Scapania paludosa papillosa* C. Müll. Frib.

12. Part of stem, antical view,  $\times 15$ . 13. Part of stem, postical view,  $\times 15$ . 14. Leaf, antical view,  $\times 34$ . 15. Leaf, postical view,  $\times 34$ . 16. Cells from margin of leaf,  $\times 240$ . 17. Cells from middle of lobe, showing papillae,  $\times 240$ . The figures were all drawn from the type specimen.



1-11. *JUNGERMANNIA ALLENII* L. Clark

12-17. *SCAPANIA PALUDOSA PAPILLOSA* K. Müll. Frib.